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TRANSMITTAL FORM

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First Named Inventor	Srinivasa
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Examiner Name	Hirl, Joseph
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ENCLOSURES (*Check all that apply*)

- [ ] Fee Transmittal Form
  - [ ] Fee Attached
- [x] Amendment/Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
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  - [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
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Remarks

Enclosed are 3 SIGNED copies of the Appeal Brief Filed 09/10/2004, in response to the Office communication received 11/17/2004.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual	Tope-McKay & Associates
Signature	
Date	12/17/2004

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Typed or printed	Cary Tope-McKay		
Signature		Date	12/17/2004

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Srinivasa et al.

Serial No.: 09/840,286

Filed: 11/26/2001

For: "Fuzzy Interference Network for Classification of High-dimensional Data"

On Appeal to the Board of Appeals

Examiner: Hirl, Joseph

Group Art Unit: 2121

Our Ref: HRL075

BRIEF ON APPEAL

Hon. Commissioner for Patents
Washington, D.C. 20231

Sir:

This is an appeal from the Final Rejection, dated March 8, 2004, for the above identified patent application.

REAL PARTY IN INTEREST

The present application has been assigned to HRL Laboratories, LLC of Malibu, CA.

RELATED APPEALS AND INFERENCES

There are no related appeals or interferences to this application.

STATUS OF CLAIMS

Claims 1-19 are the subject of this appeal. A copy of all claims of the application is contained in the attached Appendix A.

STATUS OF AMENDMENTS

No Amendments have been entered.

SUMMARY OF INVENTION

The invention described and claimed in the present application relates generally to data processing systems and methods. More specifically, it relates to the generation of an artificial neural network-generated fuzzy expert system from which an accurate, compact, interpretable, and meaningful set of rules may be extracted.

Current fuzzy inference networks used for on-line learning are limited to use in the classification of low-dimensional data. The present invention extends the ability of current fuzzy inference networks to facilitate classification of high-dimensional data. With current fuzzy inference networks, because the classification process depends on the multiple of an increasing number of values between 0 and 1, the overall multiple becomes increasingly small, eventually resulting in numbers too small to be computationally practical. An object of the present invention is to divorce the dependency fuzzy inference network's operation from the number of dimensions in the data classified. Two operations are employed to this end: tuning the fuzzy rules based on the classification error; and applying a learning rule to update the membership function parameters.

The self-constructing fuzzy inference network (SONFIN) is an example of an on-line learning fuzzy inference network to which the current invention may be applied. A description of the SOFIN is provided on pages 2-4 of the present application.

A block diagram depicting the basic architecture of an embodiment of the present invention is shown in **FIG. 3** of the present application. The on-line learning fuzzy inference network **300** represents a network such as the SONFIN. The output **302** of the

on-line learning fuzzy inference network **300** is provided to a rule tuning and learning law application processor **304**. The rule tuning and learning law application processor **304** provides two functions.

First, a threshold-based criterion for rule recruiting is used to determine whether the firing strength of the fuzzy rule with the greatest firing strength for the input exceeds a predetermined threshold. If the firing strength of the rule exceeds the predetermined threshold, which is set to ensure that a fuzzy rule provides a large enough output for computational effectiveness, the rule is tested to determine whether it properly classified the input data. If the fuzzy rule properly classified the input data, a learning rule is applied to update the parameters of the membership functions of the fuzzy rule. If the fuzzy rule did not properly classify the input data, or if the firing strength of the fuzzy rule with the greatest firing strength for the input data did not exceed the predetermined threshold level, then the a new fuzzy rule is created and added to the rule base. The new fuzzy rule is created by applying a fuzzy similarity measure between each membership function of the rule and the corresponding input data for the dimension corresponding to the membership function and generating the new fuzzy rule incorporating both new membership functions corresponding to those dimensions for which the fuzzy similarity measure was not satisfied and those membership functions of the original fuzzy rule corresponding to those dimensions for which the fuzzy similarity measure was satisfied.

When the next input is presented, and if an existing rule is selected based on its firing strength exceeding the predetermined threshold, then the membership function parameters (typically the mean and variance of the membership functions) are updated based on the magnitudes of the error in classification $|e|$ and the frequency of firing count

f_J the rule. So, if the rule is relatively new, then its frequency of firing is low and so the magnitude of classification error plays an important role in adjusting the mean and variance of the Gaussian membership functions. When a rule has fired several times in the past, the frequency of firing count f_J increases, so the effect of error in misclassification starts to diminish for that rule, causing the creation of a new rule. In this manner, the rules created are more robust because importance is given to their past, and yet in the formative stages of a rule, a lot of weight is given to the misclassification errors $|e|$, with the goal of shifting the membership function parameters to compensate for the misclassification error.

Another possible variant is to prevent updating the frequency of firing for a rule if $|e|$ is greater than a user-defined threshold. This variation will result in more parameter tuning for the Gaussian membership functions of a given rule and thus minimize the number of rules created.

A flowchart detailing the method of the present invention is provided in **FIG. 4.** A description of the acts in FIG. 4 is provided on pages 28-30 of the present application.

ISSUES

Issue 1 – Are Claims 1-10 and 19 directed toward non-statutory subject matter, and thus patentable under 35 U.S.C. 101?

Issue 2- Are Claims 1, 2, 10, 11, 12 and 19 patentable under 35 U.S.C. 102(b) over Sirag, Jr. et al., U.S. Patent No. 5,252,789) ("the Sirag Patent")?

GROUPING OF CLAIMS

The ground of rejection which appellant contests herein applies to more than one claim, such additional claims, to the extent separately identified and argued below, do not stand or fall together.

THE ARGUMENT

Issue 1- Are Claims 1-10 and 19 directed toward non-statutory subject matter, and thus patentable under 35 U.S.C. 101?

In sections 4 and 5 of the Office Action of August 25, 2003, the Examiner rejected Claims 1-10 and 19 under 35 U.S.C. 101 because the invention is directed to non-statutory subject matter. The Examiner further stated that "The practical application test requires that a useful, concrete and tangible result be accomplished. The Examiner asserted that Claims 1-10 and 19 represent abstract methodology and therefore are intangible.

In section 6 of the Office Action of March 8, 2004, the Examiner responded to the Appellants previous response. The Appellants argued that Claims 1-10 and 19 claims a useful, concrete and tangible result. Specifically, regarding Claim 1, the Appellants argued that the useful, concrete and tangible result is the improvement in the generation of an on-line fuzzy inference network for the classification of data, where when there is no match, classification error is utilized to tune the fuzzy rule, and when there is a match the membership function parameters are updated to minimize the classification error. In his response, the Examiner stated at the moment, Claims 1-10 and 19 could be preformed by hand and thus the rejection remains. Further, regarding Claim 11 (not rejected under 35 U.S.C. 101) the Examiner explained that Claim 11 is tangible embodied in the technical arts because it explicitly claims the "firing frequency count being stored in the processing device."

In light of the Examiner's comments, the Appellants submit that Claims 1-10 and 19 are tangibly embodied in the technical arts and thus patentable under 35 U.S.C. 101.

MPEP in Section 2106 states that "The claimed invention as a whole must accomplish a practical application. That is, it must produce a "*useful, concrete and tangible result.*"" citing to State Street, 149 F.3d at 1373.

Claim 1

Claim 1 claims, in part, "An improved method for generating an on-line learning fuzzy inference network ...comprising: ... storing a firing frequency count." While, Appellants concede that the Examiner has full latitude to interpret each claim in the broadest reasonable sense, the Appellants submit that the interpretation of the claim language should be consistent with the ordinary and customary meaning of the terms used in the claims as well as the specification. As stated in MPEP 2111, the claims must be "given the broadest reasonable interpretation consistent with the specification." *In re Prater*, 415 F.2d 1393, 1405 (CCPA 1969). In discussing Claim construction, the Court of Appeals for the Federal Circuit in *Unitherm Food Systems, Inc. v. Swift Eckrich, Inc.*, 375 F.3d 1341 (2004) stated that "It has been long recognized in our precedent and in the precedent of our predecessor court the Court of Customs and Patent Appeals, that dictionaries, encyclopedias, and treatises are particularly useful resources to assist the court in determining the ordinary and customary meanings of claim terms." The court goes on to indicate that the presumption of ordinary and customary meaning may be overcome where the patentee, acting as his or her own lexicographer, has clearly set forth an explicit definition of the term different from its ordinary meaning. In this case, the Appellants request that the ordinary and customary meaning of the term "on-line" be used in interpreting the claims.

Appellants turn to the dictionary definition of on-line. Merriam-Webster OnLine Dictionary ®, available at http://www.m-w.com, defines the term online to be connected to, served by, or available through a system and especially a computer or telecommunications system, and also done while connected to such a system. A print out of the web-page can be found in Appendix B of this Appeal Brief.

The Appellants submit that the term "on-line" (when given its ordinary and customary meaning) in the preamble of Claim 1 in conjunction with the term "storing" in

the body of Claim 1 make it clear that Claim 1 could not be performed by hand, but instead would be performed by a processing device. Thus, the Appellants submit that Claim 1 is tangibly embodied in the technical arts, and thus patentable under 35 U.S.C. 101.

Claim 2

Claim 2 is dependent upon Claim 1. Since Claim 2 incorporates all of the limitations of Claim 1, Claim 2 is also tangibly embodied in the technical arts, and thus patentable under 35 USC 101.

Claim 3

Claim 3 is dependent upon Claim 1. Since Claim 3 incorporates all of the limitations of Claim 1, Claim 3 is also tangibly embodied in the technical arts, and thus patentable under 35 USC 101.

Claim 4

Claim 4 is dependent upon Claim 3. Since Claim 4 incorporates all of the limitations of Claim 3, Claim 4 is also tangibly embodied in the technical arts, and thus patentable under 35 USC 101.

Claim 5

Claim 5 is dependent upon Claim 4. Since Claim 5 incorporates all of the limitations of Claim 4, Claim 5 is also tangibly embodied in the technical arts, and thus patentable under 35 USC 101.

Claim 6

Claim 6 is dependent upon Claim 4. Since Claim 6 incorporates all of the limitations of Claim 4, Claim 6 is also tangibly embodied in the technical arts, and thus patentable under 35 USC 101.

Claim 7

Claim 7 is dependent upon Claim 4. Since Claim 7 incorporates all of the limitations of Claim 4, Claim 7 is also tangibly embodied in the technical arts, and thus patentable under 35 USC 101.

Claim 8

Claim 8 is dependent upon Claim 1. Since Claim 8 incorporates all of the limitations of Claim 1, Claim 8 is also tangibly embodied in the technical arts, and thus patentable under 35 USC 101.

Claim 9

Claim 9 is dependent upon Claim 8. Since Claim 9 incorporates all of the limitations of Claim 8, Claim 9 is also tangibly embodied in the technical arts, and thus patentable under 35 USC 101.

Claim 10

Claim 10 claims, in part, "An improved method for generating an on-line learning fuzzy inference network ... providing an on-line learning fuzzy inference network ... wherein the firing frequency count of each fuzzy rule is stored ..."

Appellants refer to the discussion of Claim 1 for the definition of the term "on-line." The Appellants submit that the term "on-line" (when given its ordinary and customary meaning) and the term "storing" in the body of Claim 10 make it clear that Claim 10 could not be performed by hand, but instead would be performed by a processing device.

Thus, the Appellants submit that Claims 10 is tangibly embodied in the technical arts, and thus is patentable under 35 U.S.C. 101.

Claim 19

Claim 19 claims, in part, "An improved training system for a fuzzy inference network for on-line classification of data comprising: an on-line learning fuzzy inference network ... wherein the firing frequency count of each fuzzy rule is stored."

Appellants refer to the discussion of Claim 1 for the definition of the term "on-line." The Appellants submit that the term "on-line" (when given its ordinary and customary meaning) and the term "storing" in the body of Claim 19 make it clear that Claim 19 could not be performed by hand, but instead would be performed by a processing device.

Further, Claim 19 claims, in part, "a rule tuning and learning rule application processor connected with the fuzzy inference network to receive the fuzzy rules ... said processor operative for determining whether the firing strength of the fuzzy rule having the greatest firing strength exceeds a predetermined threshold ..." The terms "processor" should make it clear that Claim 19 could not be performed by hand, but instead would be performed by a processing device.

Thus, the Appellants submit that Claim 19 is tangibly embodied in the technical arts, and thus is patentable under 35 U.S.C. 101.

Issue 2 – Are Claims 1, 2, 10, 11, 12 and 19 patentable under 35 U.S.C. 102(b) over Sirag, Jr. et al., U.S. Patent No. 5,252,789) ("the Sirag Patent")?

In section 7 of the Office Action of March 8, 2004, the Examiner rejected Claims 1, 2, 10, 11, 12 and 19 under 35 USC §102(b) as being anticipated by Sirag, Jr. et al. (U.S. Patent No. 5,252,789) ("the Sirag Patent"). The Appellants submit that the Sirag Patent does not describe each and every element as set forth in the rejected claims.

The Appellants submit that for many of the claims rejected under 35 USC 102(b), the Examiner reached an improper conclusion regarding the teachings of the Sirag Patent and incorrectly interpreted the limitations of the rejected claims. As stated in MPEP 2111, the claims must be "given the broadest reasonable interpretation consistent with the specification." *In re Prater*, 415 F.2d 1393, 1405 (CCPA 1969). However, the "broadest reasonable interpretation of the claims must also be consistent with the interpretation that those skilled in the art would reach." MPEP 2111 quoting *In re Cortright*, 165 F.2d

1353, 1359 (Fed. Cir. 1999). As discussed below, the Appellants submit that the Examiner had not given the rejected claims the broadest reasonable interpretation consistent with either the specification or with the interpretation that those skilled in the art would reach. Therefore, when the rejected claims are given their broadest reasonable interpretation, the Appellants assert that the Sirag Patent does not describe each and every element as set forth in the rejected claims.

Claim 1

Regarding Claim 1, the Examiner asserted, in the Final Office Action dated March 8, 2004, that the col. 5, lines 59-68 and col. 6, lines 1-26 of the Sirag Patent anticipate a. storing a firing frequency count and incrementing the firing frequency count for each fuzzy rule, indicating the number of times the fuzzy rule has been fired. The Examiner noted that a histogram defines a relationship between an "event" and the number of times the event occurred; the event is synonymous with a fuzzy rule and the number of times is synonymous with the firing frequency count. The Examiner also stated that col. 6, lines 29-35 of the Sirag Patent anticipates determining whether the firing strength of the fuzzy rule having the greatest firing strength exceeds a predetermined threshold. The Examiner noted that the firing strength is synonymous with frequency count. Further, the Examiner stated that col. 6, lines 36-68 of the Sirag Patent anticipates, in the case where the firing strength of the fuzzy rule having the greatest firing strength exceeds the threshold, tuning the fuzzy rule based on the classification error. The Examiner noted that the assigning of weight is associated with classification error. In addition, the Examiner stated that col. 8, lines 4-6 of the Sirag Patent anticipates, in the case where the firing strength of the fuzzy rule having the greatest firing strength does not exceed a certain threshold, determining whether the classification membership generated by the fuzzy rule having the greatest firing strength correctly matches the known classification membership of the test data. Further, the Examiner stated that col. 7, lines 37-47 and col. 8, lines 24-38 of the Sirag Patent anticipates, the case where the classification membership generated by the fuzzy rule having the greatest firing strength does not correctly match the known classification membership of the test data, tuning the fuzzy rule based on the classification error as in

step c. Finally, the Examiner stated that col. 7, lines 37-47 and col. 6, lines 16-35 of the Sirag Patent anticipates, in the case where the classification membership generated by the fuzzy rule having the greatest firing strength correctly matches the known classification membership of the test data, applying a learning rule to update the membership function parameters such that the classification error is minimized for high-dimensional classification tasks. The Examiner noted that the substance of the preamble is anticipated by cols. 5 and 6 of Sirag.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." MPEP 2131 quoting *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987). The Appellants submit that the cited reference does not teach all of the elements as set forth in Claim 1.

The Appellants submit that the Examiner misinterpreted the Sirag Patent. The Appellants note that a claim is anticipated only if each and every element *as set forth in the claim* is found in the prior art. As discussed in detail below, the Appellants assert that the Examiner used a variety of different thresholds in the Sirag Patent to teach the threshold recited in Claim 1. However, the Appellants submit that Claim 1 claims a threshold and what happens when that threshold is or is not exceeded. Further, when the threshold is not exceeded, Claim 1 claims what happens when the fuzzy rule matches or does not match the known classification membership of the test data. From the Appellants' understanding of the Examiner's rejection, the Appellants believe that the Examiner misinterpreted the Sirag Patent by using a variety of thresholds to reject the threshold recited in Claim 1. Further, the Appellants submit that the Examiner misinterpreted the Sirag Patent by using the same thresholds of the Sirag Patent to reject both the threshold and classification membership recited in Claim 1. In general, the Appellants submit that the Examiner's rejection of the pending claims using the Sirag Patent is inconsistent with how the elements are set forth in the claims.

Clam 1 claims, in part, "determining whether the firing strength of the fuzzy rule having the greatest firing strength exceeds a predetermined threshold." The Examiner indicted that col. 6, lines 29-35 of the Sirag Patent anticipates this element. The Examiner noted that the firing strength is synonymous with frequency count.

Col. 6, lines 29-35 of the Sirag Patent describes the plot shown in FIG. 3. It describes each plot as having an abscissa of weight and an ordinate of some normalized, dimensionless value, such as zero to one, which represents the relative likelihood that a number of passengers provide a weight signal of so many pounds.

The Appellants point out that Claim 1 claims "the firing strength of the fuzzy rule having the *greatest* firing strength." The Sirag Patent neither teaches nor suggests the firing strength of the fuzzy rule having the greatest firing strength. Even if the Appellants were to agree with the Examiner that the horizontal lines of FIG. 3 are thresholds (as the Examiner stated in his response to the Appellants arguments in the final Office Action), and using the most strained interpretation, nowhere does the Sirag Patent teach, disclose or suggest determining the fuzzy rule having the *greatest* firing strength.

Further, while the Examiner does have full latitude to interpret each claim in the broadest reasonable sense, the Appellants submit that the Examiner must be consistent in his interpretation of the claims. If the Examiner states that the horizontal lines in FIG. 3 are the thresholds claimed in Claim 1, then the Appellants submit that these are the thresholds that must be used when interpreting the rest of the elements of the Claims. The Appellants do not agree with the Examiner that the horizontal lines of FIG. 3 (labeled as thresholds by the Examiner) anticipate the remainder of the claim language. The Sirag Patent neither teaches nor suggests using these thresholds to determine further action by the elevator system.

While the Appellants concede that thresholds abound in the Sirag Patent, the Appellants do not agree that the Sirag Patent uses the thresholds in a manner consistent with the claims of the present invention.

First, assuming, for lack of another hypothesis, that PCMAX of the Sirag Patent teaches a threshold as claimed in Claim 1, the Appellants submit that the Sirag Patent does not teach all of the remaining elements of Claim 1. Claim 1 claims, in part, "in the case where the firing strength of the fuzzy rule having the greatest firing strength exceeds the threshold, tuning the fuzzy rule based on the classification error." In section 7 of the Office Action, the Examiner stated that this element is taught by col. 6, lines 36-68 of the Sirag Patent, noting that the assigning of weight is associated with classification error. The Sirag Patent states, in col. 6, lines 48-51, that "If PC is not greater than PCMAX, …

a term taken from the fuzzy set OF(PC) stored in the observed weight data element 53 is added to the fuzzy set FW." Thus, the Sirag Patent teaches that the assigning of weight is performed when the variable PC is less than PCMAX, not when the "firing strength ... exceeds the threshold" as is claimed in Claim 1. Therefore, this teaching of the Sirag Patent does not anticipate this element of Claim 1.

The next element of Claim 1 is "in the case where the firing strength ... does not exceed the threshold, determining whether the classification membership ... correctly matches the known classification membership of the test data." In section 7 of the Office Action, the Examiner stated that this element is taught in the Sirag Patent at col. 8, lines 4-6. Col. 8, lines 4-6 refer to Fig. 5. The thresholds presented in Fig. 5 are entirely different than the thresholds presented in Fig. 4, upon which the Examiner relied to reject the previous element of the claim. In Claim 1, it is clear that only one threshold is being used, and that the various elements of Claim 1 are acts which are preformed depending upon the value's comparison to the threshold. While the Examiner may interpret the claim language broadly, each and every element *as set forth in the claim* must be found in the prior art. Claim 1 sets forth a threshold with various results depending upon the outcome of the variable being compared to the threshold. Although, the Examiner has cited the thresholds of the Sirag Patent to the Appellants, the Examiner has not presented arguments regarding how the Sirag Patent anticipates the elements *as set forth* in Claim 1. The Appellants submit that one skilled in the art, looking at the Sirag Patent, would not use the different thresholds of the Sirag Patent to arrive at the invention claimed in Claim 1 of the Appellants' patent application. Therefore, the Appellants submit that the Sirag Patent does not teach, disclose or suggest this element of Claim 1.

Claim 1 further claims, in part, "in the case where the classification membership ... does not correctly match the known classification membership ... tuning the fuzzy rule based on the classification error." In his response to the Appellants' previous arguments, the Examiner stated "the Sirag Patent teaches when the PC variable is not greater than PCMAX adding a data weight element to the fuzzy set and incrementing the PC variable which is equivalent to where the classification membership ... does not correctly match the known classification membership ... tuning the fuzzy rule based on

the classification error." The Examiner also stated that when PC < PCMAX, the flow in the Sirag Patent, FIG. 4, is down the right side where the value is stored.

The Appellants note that Claim 1 claims, "where the classification membership ... does not correctly match the known classification membership." The Appellants submit that this element is not taught, disclosed or suggested in the Sirag Patent. The Sirag Patent teaches comparing a variable PC to a threshold PCMAX. Even with the most strained interpretation, the variable PC and the threshold PCMAX could not reasonably be understood to mean "classification membership."

Further, the Examiner used PCMAX to refer to the firing strength threshold in the part of Claim 1 which claimed, "in the case where the firing strength ... exceeds the threshold, tuning the fuzzy rule based on the classification error." The Appellants submit that the same step in the prior art cannot both anticipate a firing strength threshold and classification membership, when these are different elements of the same claim.

For the reasons set forth above, the Appellants submit that Claim 1 is patentable over the Sirag Patent.

<u>Claim 2</u>

Claim 2, dependent on Claim 1, is patentable by virtue of its dependency.

<u>Claim 10</u>

Regarding Claim 10, starting on page 8 of the Final Office Action dated March 8, 2004, the Examiner stated that the Sirag Patent "anticipates a. providing an on-line learning fuzzy inference network, wherein the fuzzy inference network generates a rule base of fuzzy rules, with each fuzzy rule assigned to a class label, and each fuzzy rule including at least one membership function corresponding to a dimension of the data, with each membership function including membership function parameters, wherein the fuzzy rules are used for classifying input data into memberships, wherein test data with a known classification membership is provided to the fuzzy inference network and wherein the fuzzy inference network uses the fuzzy rules to generate classification memberships for the test data by firing the fuzzy rules with each fuzzy rule fired assigned a firing strength based on its match to the test data, and determining the fuzzy rule having the

greatest firing strength, where the membership functions of the rule having the greatest firing strength are compared to the known classification membership of the test data to determine classification error and wherein the firing frequency count of each fuzzy rule is stored, the improvement comprising (Sirag, col. 5, lines 28-68; col. 6, lines 1-68); b. determining whether the firing strength of the fuzzy rule having the greatest firing strength exceeds a predetermined threshold (Sirag, col. 6, lines 29-35); c. in the case where the firing strength of the fuzzy rule having the greatest firing strength exceeds the threshold, tuning the fuzzy rule based on the classification error (Sirag, col. 6, lines 36-68); and d. in the case were the firing strength of the fuzzy rule having the greatest firing strength does not exceed the threshold, determining whether the classification membership generated by the fuzzy rule having the greatest firing strength correctly matches the known classification membership of the test data (Sirag, col. 8, lines 4-6); i. in the case where the classification membership generated by the fuzzy rule having the greatest firing strength does not correctly match the known classification membership of the test data, tuning the fuzzy rule based on the classification error as provided in the case represented by c (Sirag, col. 7, lines 37-47; col. 8, lines 24-38); and ii. In the case where the classification membership generated by the fuzzy rule having the greatest firing strength correctly matches the known classification membership of the test data, applying a learning rule to update the membership function parameters such that the classification error is minimized for high-dimensional classification tasks (Sirag, col. 7, lines 37-47; col. 6, lines 16-35)."

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." MPEP 2131 quoting *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987). The Appellants submit that the cited reference does not teach all of the elements as set forth in Claim 10.

The Appellants submit that the Examiner rejected Claim 10 using the same rationale that formed the basis for his rejection of Claim 1. The arguments that the Appellants submitted regarding Claim 1 can also be applied to the rejection of Claim 10. The arguments are repeated here for completeness.

The Appellants submit that the Examiner misinterpreted the Sirag Patent. The Appellants submit that a claim is anticipated only if each and every element *as set forth in the claim* is found in the prior art. As discussed in detail below, the Appellants assert that the Examiner used a variety of different thresholds in the Sirag Patent to teach the threshold recited in Claim 10. However, the Appellants submit that Claim 10 claims a threshold and what happens when that threshold is or is not exceeded. Further, when the threshold is not exceeded, Claim 10 claims what happens when the fuzzy rule matches or does not match the known classification membership of the test data. From the Appellants' understanding of the Examiner's rejection, the Appellants believe that the Examiner misinterpreted the Sirag Patent by using a variety of thresholds to reject the threshold recited in Claim 10. Further, the Appellants submit that the Examiner misinterpreted the Sirag Patent by using the same thresholds of the Sirag Patent to reject both the threshold and classification membership recited in Claim 10. In general, the Appellants submit that the Examiner's rejection of the pending claims using the Sirag Patent is inconsistent with how the elements are set forth in the claims.

Clam 10 claims, in part, "determining whether the firing strength of the fuzzy rule having the greatest firing strength exceeds a predetermined threshold." The Examiner indicted that col. 6, lines 29-35 of the Sirag Patent anticipates this element. The Examiner noted that the firing strength is synonymous with frequency count.

Col. 6, lines 29-35 of the Sirag Patent discusses the plot shown in FIG. 3. It describes each plot as having an abscissa of weight and an ordinate of some normalized, dimensionless value, such as zero to one, which represents the relative likelihood that a number of passengers provide a weight signal of so many pounds.

The Appellants point out that Claim 10 claims "the firing strength of the fuzzy rule having the *greatest* firing strength." The Sirag Patent neither teaches nor suggests the firing strength of the fuzzy rule having the greatest firing strength. Even if the Appellants were to agree with the Examiner that the horizontal lines of FIG. 3 are thresholds (as the Examiner stated in his response to the Appellants arguments in the final Office Action), and using the most strained interpretation, nowhere does the Sirag Patent teach, disclose or suggest determining the fuzzy rule having the *greatest* firing strength.

Further, while the Examiner does have full latitude to interpret each claim in the broadest reasonable sense, the Appellants submit that the Examiner must be consistent in his interpretation of the claims. If the Examiner states that the horizontal lines in FIG. 3 are the thresholds claimed in Claim 10, then the Appellants submit that these are the thresholds that must be used when interpreting the rest of the elements of the Claims. The Appellants do not agree with the Examiner that the horizontal lines of FIG. 3 (labeled as thresholds by the Examiner) anticipate the remainder of the claim language. The Sirag Patent neither teaches nor suggests using these thresholds to determine further action by the elevator system.

While the Appellants concede that thresholds abound in the Sirag Patent, the Appellants do not agree that the Sirag Patent uses the thresholds in a manner consistent with the claims of the present invention.

First, assuming for lack of another hypothesis, that PCMAX of the Sirag Patent teaches a threshold as claimed in Claim 10, the Appellants submit that the Sirag Patent does not teach all of the remaining elements of Claim 10. Claim 10 claims, in part, "in the case where the firing strength of the fuzzy rule having the greatest firing strength exceeds the threshold, tuning the fuzzy rule based on the classification error." In section 7 of the March 8, 2004, Office Action, the Examiner stated that this element is taught by col. 6, lines 36-68 of the Sirag Patent, noting that the assigning of weight is associated with classification error. The Sirag Patent states, in col. 6, lines 48-51, that "If PC is not greater than PCMAX, ... a term taken from the fuzzy set OF(PC) stored in the observed weight data element 53 is added to the fuzzy set FW." Thus, the Sirag Patent teaches that the assigning of weight is performed when the variable PC is less than PCMAX, not when the "firing strength ... exceeds the threshold" as is claimed in Claim 10. Therefore, this teaching of the Sirag Patent does not anticipate this element of Claim 10.

The next element of Claim 10 is "in the case where the firing strength ... does not exceed the threshold, determining whether the classification membership ... correctly matches the known classification membership of the test data." In section 7 of the March 8, 2004, Office Action, the Examiner stated that this element is taught in the Sirag Patent at col. 8, lines 4-6. Col. 8, lines 4-6 refer to Fig. 5. The thresholds presented in Fig. 5 are entirely different than the thresholds presented in Fig. 4, which the Examiner relied upon

to reject the previous element of the claim. In Claim 10, it is clear that only one threshold is being used, and that the various elements of Claim 10 are acts which are preformed depending upon the value's comparison to the threshold. While, the Examiner may interpret the claim language broadly, each and every element *as set forth in the claim* must be found in the prior art. Claim 10 sets forth a threshold with various results depending upon the outcome of the variable being compared to the threshold. Although, the Examiner has cited the thresholds of the Sirag Patent to the Appellants, the Examiner has not presented arguments regarding how the Sirag Patent anticipates the elements *as set forth* in Claim 10. The Appellants submit that one skilled in the art, looking at the Sirag Patent, would not use the different thresholds of the Sirag Patent to arrive at the invention as claimed in Claim 10 of the Appellants patent application. Therefore, the Appellants submit that the Sirag Patent does not teach, disclose or suggest this element of Claim 10.

Claim 10 further claims, in part, "in the case where the classification membership ... does not correctly match the known classification membership ... tuning the fuzzy rule based on the classification error." In his response to the Appellants' previous arguments, the Examiner stated "the Sirag Patent teaches when the PC variable is not greater than PCMAX adding a data weight element to the fuzzy set and incrementing the PC variable which is equivalent to where the classification membership ... does not correctly match the known classification membership ... tuning the fuzzy rule based on the classification error." The Examiner also states that when PC < PCMAX, the flow in Sirag, FIG. 4, is down the right side where the value is stored.

The Appellants note that Claim 10 claims, "where the classification membership ... does not correctly match the known classification membership." The Appellants submit that this element is not taught, disclosed or suggested in the Sirag Patent. The Sirag Patent teaches comparing a variable PC to a threshold PCMAX. Even with the most strained interpretation, the variable PC and the threshold PCMAX could not reasonably be understood to mean "classification membership."

Further, the Examiner used PCMAX to refer to the firing strength threshold in the part of Claim 10 which claimed, "in the case where the firing strength ... exceeds the threshold, tuning the fuzzy rule based on the classification error." The Appellants submit

that the same step in the prior art cannot both anticipate a firing strength threshold and classification membership, when these are different elements of the same claim.

For the reasons set forth above, the Appellants submit that Claim 10 is patentable over the Sirag Patent.

Claim 11

Regarding Claim 11, starting on page 10 of the Office Action dated March 8, 2004, the Examiner stated that the Sirag Patent "anticipates a firing frequency count calculated for each fuzzy rule and incremented each time the fuzzy rule is fired, the firing frequency count being stored in the processing device, and a rule tuning and learning rule application processor connected with the fuzzy inference network to receive fuzzy rules (Sirag, col. 5, lines 27-68; col. 6, lines 1-68; FIG. 2); the classification error (Sirag, col. 5, lines 27-49); the firing strength, the firing frequency count, and the classification membership generated by the fuzzy rule having the greatest firing strength (Sirag, col. 5, lines 59-68; col. 6, lines 1-28); the test data, and the known classification memberships for the test data (Sirag, col. 5, lines 36-68); said processor operative for determining whether the firing strength of the fuzzy rule having the greatest firing strength exceeds a predetermined threshold (Sirag, FIG. 2; col. 6, lines 59-63); and a. in the case where the firing strength of the fuzzy rule having the greatest firing strength exceeds the threshold, tuning the fuzzy rule based on the classification error (Sirag, col. 6, lines 36-68); and b. in the case where the firing strength of the fuzzy rule having the greatest firing strength does not exceed the threshold, determining whether the classification membership generated by the fuzzy rule having the greatest firing strength correctly matches the known classification membership of the test data (Sirag, col. 8, lines 4-6); i. in the case where the classification membership generated by the fuzzy rule having the greatest firing strength does not correctly match the known classification membership of the test data, tuning the fuzzy rule based on the classification error (Sirag, col. 7, lines 37-47; col. 8, lines 24-38) and ii. In the case where the classification membership generated by the fuzzy rule having the greatest firing strength correctly matches the known classification membership of the test data, applying a learning rule to update the membership function parameters such that the classification error is minimized for high-dimensional classification tasks

(Sirag, col. 7, lines 37-47; col. 8, lines 16-35). The Examiner noted that the substance of the preamble is anticipated by the Sirag Patent at cols. 5 and 6."

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." MPEP 2131 quoting *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987). The Appellants respectfully submit that the cited reference does not teach all of the elements as set forth in Claim 11.

Claim 11 claims, in part, "a firing frequency count calculated for each fuzzy rule and incremented each time the fuzzy rule is fired, the firing frequency count being stored in the processing device, and a rule tuning and learning rule application processor connected with the fuzzy inference network to receive fuzzy rules." The Examiner simply referred to the Sirag Patent, col. 5, lines 27-68; col. 6, lines 1-68 and FIG. 2 as anticipating all of these elements. Regarding FIG. 2, col. 3, lines 32-36 of the Sirag Patent explain that boxes on the diagram 50 indicated program modules (portions of the elevator control software) while the cylinders indicate data elements (portions of the elevator control data). The remaining sections of the Sirag Patent cited by the Examiner in cols. 5 and 6 refer to the operation of the weight interpretation module 52. The Appellants have no idea which of the modules in FIG. 2, the Examiner has interpreted as anticipating the tuning and learning rule application processor connected with the fuzzy inference network to receive fuzzy rules. In light of the Examiner's citation of cols. 5 and 6 of the Sirag Patent, the Appellants assume that the Examiner was using the weight interpretation module to anticipate the turning and learning module.

The Examiner stated that the Sirag Patent in col. 5, lines 27-49 anticipates the classification error. The Sirag Patent in col. 5, lines 27-49 explains that the weight interpretation module 52 transforms the WEIGHT signal from each of the weight sensors 42 and 43, one at a time, into an estimate of the number of car passengers by using fuzzy logic. The Appellants submit that the term "error signal," even when interpreted broadly, is not an estimate, but rather a wrong decision. The Appellants submit the areas cited by the Examiner indicate an estimate, which is not an error.

The Appellants submit that the Examiner also rejected Claim 11 using the same rationale that formed the basis for his rejection of Claim 1. The arguments that the

Appellants submitted regarding Claim 1 can also be applied to the rejection of Claim 11. However, the Appellants note that the Examiner used somewhat different parts of the Sirag Patent to reject the elements of Claim 11. Therefore, the arguments presented below have been changed from the arguments presented in relation to Claim 1, where appropriate, to reflect the different parts of the Sirag Patent that the Examiner used in his rejection of Claim 11.

The Appellants submit that the Examiner misinterpreted the Sirag Patent. The Appellants note that a claim is anticipated only if each and every element *as set forth in the claim* is found in the prior art. As discussed in detail below, the Appellants assert that the Examiner used a variety of different thresholds in the Sirag Patent to teach the threshold recited in Claim 11. However, the Appellants submit that Claim 11 claims a threshold and what happens when that threshold is or is not exceeded. Further, when the threshold is not exceeded, Claim 11 claims what happens when the fuzzy rule matches or does not match the known classification membership of the test data. From the Appellants' understanding of the Examiner's rejection, the Appellants believe that the Examiner misinterpreted the Sirag Patent by using a variety of thresholds to reject the threshold recited in Claim 11. Further, the Appellants submit that the Examiner misinterpreted the Sirag Patent by using the same thresholds of the Sirag Patent to reject both the threshold and classification membership recited in Claim 11. In general, the Appellants submit that the Examiner's rejection of the pending claims using the Sirag Patent is inconsistent with how the elements are set forth in the claims.

Clam 11 claims, in part, "said processor operative for determining whether the firing strength of the fuzzy rule having the greatest firing strength exceeds a predetermined threshold." The Examiner indicted that col. 6, lines 59-63 of the Sirag Patent anticipates this element.

The Appellants point out that Claim 11 claims "the firing strength of the fuzzy rule having the *greatest* firing strength." The Sirag Patent neither teaches nor suggests the firing strength of the fuzzy rule having the *greatest* firing strength. Even if the Appellants were to agree with the Examiner that the PCMAX is a threshold (as the Examiner stated in his response to the Appellants arguments in the present Office

Action), and using the most strained interpretation, nowhere does the Sirag Patent teach, disclose or suggest determining the fuzzy rule having the *greatest* firing strength.

Further, while the Examiner does have full latitude to interpret each claim in the broadest reasonable sense, the Appellants submit that the Examiner must be consistent in his interpretation of the claims. If the Examiner states that the variable PCMAX is the threshold claimed in Claim 11, then the Appellants submit that this is the threshold that must be used when interpreting the rest of the elements of the Claims. The Appellants do not agree with the Examiner that the variable PCMAX anticipates the remainder of the claim language. The Sirag Patent does not use this threshold is used to determine further action by the elevator system.

While the Appellants concede that thresholds abound in the Sirag Patent, the Appellants do not agree that the Sirag Patent uses the thresholds in a manner consistent with the claims of the present invention.

First, assuming, for lack of another hypothesis, that PCMAX of the Sirag Patent teaches a threshold as claimed in Claim 11, the Appellants submit that the Sirag Patent does not teach all of the remaining elements of Claim 11. Claim 11 claims, in part, "in the case where the firing strength of the fuzzy rule having the greatest firing strength exceeds the threshold, tuning the fuzzy rule based on the classification error." In section 7 of the March 8, 2004, Office Action, the Examiner stated that this element is taught by col. 6, lines 36-68 of the Sirag Patent, noting that the assigning of weight is associated with classification error. The Sirag Patent in, col. 6, lines 48-51, states that "If PC is not greater than PCMAX, ... a term taken from the fuzzy set OF(PC) stored in the observed weight data element 53 is added to the fuzzy set FW." Thus, the Sirag Patent teaches that the assigning of weight is performed when the variable PC is less than PCMAX, not when the "firing strength ... exceeds the threshold" as is claimed in Claim 11. Therefore, this teaching of the Sirag Patent does not anticipate this element of Claim 11.

The next element of Claim 11 is "in the case where the firing strength ... does not exceed the threshold, determining whether the classification membership ... correctly matches the known classification membership of the test data." In section 7 of the March 8, 2004, Office Action, the Examiner stated that this element is taught in the Sirag Patent at col. 8, lines 4-6. Col. 8, lines 4-6 refer to Fig. 5. The thresholds presented in Fig. 5 are

entirely different than the threshold variable PCMAX, upon which the Examiner relied to reject the previous element of the claim. In Claim 11, it is clear that only one threshold is being used, and that the various elements of Claim 11 are acts which are preformed depending upon the value's comparison to the threshold. While, the Examiner may interpret the claim language broadly, each and every element *as set forth in the claim* must be found in the prior art. Claim 11 sets forth a threshold with various results depending upon the outcome of the variable being compared to the threshold. The Appellants do not believe that the Examiner presented arguments regarding how the Sirag Patent anticipates the elements as set forth in Claim 11. The Appellants submit that one skilled in the art, looking at the Sirag Patent, would not use the different thresholds of the Sirag Patent to arrive at the invention as claimed in Claim 11 of the Appellants' patent application. Therefore, the Appellants submit that the Sirag Patent does not teach, disclose or suggest this element of Claim 11.

Claim 11 further claims, in part, "in the case where the classification membership ... does not correctly match the known classification membership ... tuning the fuzzy rule based on the classification error." In his response to the Appellants' previous arguments, the Examiner stated "the Sirag Patent teaches when the PC variable is not greater than PCMAX adding a data weight element to the fuzzy set and incrementing the PC variable which is equivalent to where the classification membership ... does not correctly match the known classification membership ... tuning the fuzzy rule based on the classification error." The Examiner also stated that when PC < PCMAX, the flow in Sirag, FIG. 4, is down the right side where the value is stored.

The Appellants note that Claim 11 claims, "where the classification membership ... does not correctly match the known classification membership." The Appellants submit that this element is not taught, disclosed or suggested in the Sirag Patent. The Sirag Patent teaches comparing a variable PC to a threshold PCMAX. Even with the most strained interpretation, the variable PC and the threshold PCMAX could not reasonably be understood to mean "classification membership."

Further, the Examiner used PCMAX to refer to the firing strength threshold in the part of Claim 11 which claimed, "in the case where the firing strength ... exceeds the threshold, tuning the fuzzy rule based on the classification error." The Appellants submit

that the same step in the prior art can not both anticipate a firing strength threshold and classification membership, when these are different elements of the same claim.

For the reasons set forth above, the Appellants submit that Claim 11 is patentable over the Sirag Patent.

Claim 12

Claim 12, dependent on Claim 11, is patentable by virtue of its dependency.

Claim 19

Regarding Claim 19, starting on page 11 of the Office Action dated March 8, 2004, the Examiner stated that the Sirag Patent "anticipates an on-line learning fuzzy inference network wherein the fuzzy inference network generates a rule base of fuzzy rules, each fuzzy rule assigned to a class label, and each fuzzy rule including at least one membership function corresponding to a dimension of the data, with each membership function including membership function parameters, wherein the fuzzy rules are used for classifying input data into memberships, wherein test data with a known classification membership is provided to the fuzzy inference network and wherein the fuzzy inference network uses the fuzzy rules to generate classification memberships for the test data by firing the fuzzy rules with each fuzzy rule fired assigned to a firing strength based on its match to the test data, and determining the fuzzy rule having the greatest firing strength, where the membership functions of the rule having the greatest firing strength are compared to the known classification membership of the test data to determine classification error and wherein the firing frequency count of each fuzzy rule is stored (Sirag, col. 5, lines 28-68; col. 6, lines 1-68); b. a rule tuning and learning rule application processor connected with the fuzzy inference network to received the fuzzy rules (Sirag, col. 5, lines 27-68; col. 6, lines 1-68; FIG. 2); the classification error (Sirag, col. 5, lines 27-49); the firing strength, the firing frequency count, and the classification membership generated by the fuzzy rule having the greatest firing strength (Sirag, col. 5, lines 59-68; col. 6, lines 1-28); the test data, and the known classification memberships for test data (Sirag, col. 5, lines 36-68); said processor operative for determining whether the firing strength of the fuzzy rule having the greatest firing strength exceeds a predetermined

threshold (Sirag, FIG. 2; col. 6, lines 59-63); and i. in the case where the firing strength of the fuzzy rule having the greatest firing strength exceeds the threshold, tuning the fuzzy rule based on the classification error (Sirag, col. 6, lines 36-68); and ii. in the case where the firing strength of the fuzzy rule having the greatest firing strength does not exceed the threshold, determining whether the classification membership generated by the fuzzy rule having the greatest firing strength correctly matches the known classification membership of the test data (Sirag, col. 8, lines 4-6); a. in the case where the classification membership generated by the fuzzy rule having the greatest firing strength does not correctly match the known classification membership of the test data, tuning the fuzzy rule based on the classification error (Sirag, col. 7, lines 37-47; col. 8, lines 24-38) and b. in the case where the classification membership generated by the fuzzy rule having the greatest firing strength correctly matches the known classification membership of the test data, applying a learning rule to update the membership function parameters such that the classification error is minimized for high-dimensional classification tasks (Sirag, col. 7, lines 37-47; col. 8, lines 16-35)."

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." MPEP 2131 quoting *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987). The Appellants submit that the cited reference does not teach all of the elements as set forth in Claim 19.

The Appellants submit that the Examiner rejected Claim 19 using the same rationale that formed the basis for his rejection of Claim 11. The arguments that the Appellants submitted regarding Claim 11 can also be applied to the rejection of Claim 19. The arguments are repeated here for completeness.

Claim 19 claims, in part, "a rule tuning and learning rule application processor connected with the fuzzy inference network to receive the fuzzy rules." The Examiner simply referred to the Sirag Patent, col. 5, lines 27-68; col. 6, lines 1-68 and FIG. 2 as anticipating all of these elements. Regarding FIG. 2, col. 3, lines 32-36 of the Sirag Patent explain that boxes on the diagram 50 indicated program modules (portions of the elevator control software) while the cylinders indicate data elements (portions of the elevator control data). The remaining sections of the Sirag Patent cited by the Examiner

in cols. 5 and 6 refer to the operation of the weight interpretation module 52. The Appellants have no idea which of the modules in FIG. 2, the Examiner has interpreted as anticipating the tuning and learning rule application processor connected with the fuzzy inference network to receive fuzzy rules. In light of the Examiner's citation of cols. 5 and 6 of the Sirag Patent, the Appellants assume that the Examiner was using the weight interpretation module to anticipate the turning and learning module.

The Examiner stated that the Sirag Patent in col. 5, lines 27-49 anticipates the classification error. The Sirag Patent in col. 5, lines 27-49 discusses that the weight interpretation module 52 transforms the WEIGHT signal from each of the weight sensors 42 and 43, one at a time, into an estimate of the number of car passengers by using fuzzy logic. The Appellants submit that the term "classification error" even when interpreted broadly, is not an estimate, but rather a wrong decision. The Appellants submit the areas cited by the Examiner indicate an estimate, which is not an error.

The Appellants submit that the Examiner misinterpreted the Sirag Patent. The Appellants note that a claim is anticipated only if each and every element *as set forth in the claim* is found in the prior art. As discussed in detail below, the Appellants assert that the Examiner used a variety of different thresholds in the Sirag Patent to teach the threshold recited in Claim 19. However, the Appellants submit that Claim 19 claims a threshold and what happens when that threshold is or is not exceeded. Further, when the threshold is not exceeded, Claim 19 claims what happens when the fuzzy rule matches or does not match the known classification membership of the test data. From the Appellants' understanding of the Examiner's rejection, the Appellants believe that the Examiner misinterpreted the Sirag Patent by using a variety of thresholds to reject the threshold recited in Claim 19. Further, the Appellants submit that the Examiner misinterpreted the Sirag Patent by using the same thresholds of the Sirag Patent to reject both the threshold and classification membership recited in Claim 19. In general, the Appellants submit that the Examiner's rejection of the pending claims using the Sirag Patent is inconsistent with how the elements are set forth in the claims.

Clam 19 claims, in part, "said processor operative for determining whether the firing strength of the fuzzy rule having the greatest firing strength exceeds a

predetermined threshold." The Examiner indicted that col. 6, lines 59-63 of the Sirag Patent anticipates this element.

The Appellants point out that Claim 19 claims "the firing strength of the fuzzy rule having the *greatest* firing strength." The Sirag Patent neither teaches nor suggests the firing strength of the fuzzy rule having the *greatest* firing strength. Even if the Appellants were to agree with the Examiner that the PCMAX is a threshold (as the Examiner stated in his response to the Appellants arguments in the present Office Action), and using the most strained interpretation, nowhere does the Sirag Patent teach, disclose or suggest determining the fuzzy rule having the *greatest* firing strength.

Further, while the Examiner does have full latitude to interpret each claim in the broadest reasonable sense, the Appellants submit that the Examiner must be consistent in his interpretation of the claims. If the Examiner states that the variable PCMAX is the threshold claimed in Claim 19, then the Appellants submit that this is the threshold that must be used when interpreting the rest of the elements of the Claims. The Appellants do not agree with the Examiner that the variable PCMAX anticipates the remainder of the claim language. The Sirag Patent neither teaches nor suggests that this threshold is used to determine further action by the elevator system.

While the Appellants concede that thresholds abound in the Sirag Patent, the Appellants do not agree that the Sirag Patent uses the thresholds in a manner consistent with the claims of the present invention.

First, assuming for lack of another hypothesis, that PCMAX of the Sirag Patent teaches a threshold as claimed in Claim 19, the Appellants submit that the Sirag Patent does not teach all of the remaining elements of Claim 19. Claim 19 claims, in part, "in the case where the firing strength of the fuzzy rule having the greatest firing strength exceeds the threshold, tuning the fuzzy rule based on the classification error." In section 7 of the March 8, 2004, Office Action, the Examiner stated that this element is taught by col. 6, lines 36-68 of the Sirag Patent, noting that the assigning of weight is associated with classification error. The Sirag Patent states, in col. 6, lines 48-51, that "If PC is not greater than PCMAX, ... a term taken from the fuzzy set OF(PC) stored in the observed weight data element 53 is added to the fuzzy set FW." Thus, the Sirag Patent teaches that the assigning of weight is performed when the variable PC is less than PCMAX, not

when the "firing strength … exceeds the threshold" as is claimed in Claim 19. Therefore, this teaching of the Sirag Patent does not anticipate this element of Claim 19.

The next element of Claim 19 is "in the case where the firing strength … does not exceed the threshold, determining whether the classification membership … correctly matches the known classification membership of the test data." In section 7 of the March 8, 2004, Office Action, the Examiner stated that this element is taught in the Sirag Patent at col. 8, lines 4-6. Col. 8, lines 4-6 refer to Fig. 5. The thresholds presented in Fig. 5 are entirely different than the threshold variable PCMAX, which the Examiner relied upon to reject the previous element of the claim. In Claim 19, it is clear that only one threshold is being used, and that the various elements of Claim 19 are acts which are preformed depending upon the value's comparison to the threshold. While, the Examiner may interpret the claim language broadly, each and every element *as set forth in the claim* must be found in the prior art. Claim 19 sets forth a threshold with various results depending upon the outcome of the variable being compared to the threshold. The Appellants do not believe that the Examiner presented arguments regarding how the Sirag Patent anticipates the elements as set forth in Claim 19. The Appellants submit that one skilled in the art, looking at the Sirag Patent, would not use the different thresholds of the Sirag Patent to arrive at the invention as claimed in Claim 19 of the Appellants patent application. Therefore, the Appellants submit that the Sirag Patent does not teach, disclose or suggest this element of Claim 19.

Claim 19 further claims, in part, "in the case where the classification membership … does not correctly match the known classification membership … tuning the fuzzy rule based on the classification error." In his response to the Appellants' previous arguments, the Examiner stated "the Sirag Patent teaches when the PC variable is not greater than PCMAX adding a data weight element to the fuzzy set and incrementing the PC variable which is equivalent to where the classification membership … does not correctly match the known classification membership … tuning the fuzzy rule based on the classification error." The Examiner also states that when PC < PCMAX, the flow in Sirag, FIG. 4, is down the right side where the value is stored.

The Appellants note that Claim 19 claims, "where the classification membership … does not correctly match the known classification membership." The Appellants are

unaware where in the Sirag Patent this part of this element is taught, disclosed or suggested. The Sirag Patent teaches comparing a variable PC to a threshold PCMAX. Even with the most strained interpretation, the variable PC and the threshold PCMAX could not reasonably be understood to mean "classification membership."

Further, the Examiner used PCMAX to refer to the firing strength threshold in the part of Claim 19 which claimed, "in the case where the firing strength … exceeds the threshold, tuning the fuzzy rule based on the classification error." The Appellants submit that the same step in the prior art can not both anticipate a firing strength threshold and classification membership, when these are different elements of the same claim.

For the reasons set forth above, the Appellants submit that Claim 19 is patentable over the Sirag Patent.

CONCLUSION

For the extensive reasons advanced above, the Appellants respectfully contend that each claim is patentable. Therefore, reversal of all rejections and objections is courteously solicited.

To the extent necessary, a petition for an extension of time under 37 CFR 1.136 is hereby made. Please charge any shortage of fees due in connection with the filing of this paper, including extension of time fees, to deposit account no. 50-2691 and please credit any excess fees to such deposit account.

Respectfully submitted,

9/8/2004
Date

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Encl: Appendix A – pending Claims
Appendix B – dictionary extract of on-line

APPENDIX A

1. (Original) An improved method for generating an on-line learning fuzzy inference network for the classification of data using an on-line learning fuzzy inference network, wherein the fuzzy inference network is trained in order to generate a rule base of fuzzy rules, with each fuzzy rule assigned to a class label, and each fuzzy rule including at least one membership function corresponding to a dimension of the data, with each membership function including membership function parameters, wherein the fuzzy rules are used for classifying input data into memberships, wherein test data with a known classification membership is provided to the fuzzy inference network and wherein the fuzzy inference network uses the fuzzy rules to generate classification memberships for the test data by firing the fuzzy rules with each fuzzy rule fired assigned a firing strength based on its match to the test data, and determining the fuzzy rule having the greatest firing strength, where the membership functions of the rule having the greatest firing strength are compared to the known classification membership of the test data to determine classification error, the improvement comprising:
   a. storing a firing frequency count and incrementing the firing frequency count for each fuzzy rule, indicating the number of times the fuzzy rule has been fired;
   b. determining whether the firing strength of the fuzzy rule having the greatest firing strength exceeds a predetermined threshold;

c. in the case where the firing strength of the fuzzy rule having the greatest firing strength exceeds the threshold, tuning the fuzzy rule based on the classification error; and

d. in the case where the firing strength of the fuzzy rule having the greatest firing strength does not exceed the threshold, determining whether the classification membership generated by the fuzzy rule having the greatest firing strength correctly matches the known classification membership of the test data;

    i. in the case where the classification membership generated by the fuzzy rule having the greatest firing strength does not correctly match the known classification membership of the test data, tuning the fuzzy rule based on the classification error as in step c; and

    ii. in the case where the classification membership generated by the fuzzy rule having the greatest firing strength correctly matches the known classification membership of the test data, applying a learning rule to update the membership function parameters such that the classification error is minimized for high-dimensional classification tasks.

2. (Original) A rule base generated by the method of claim 1.

3. (Original) An improved method for generating an on-line learning fuzzy inference network for the classification of data using an on-line learning fuzzy inference

network as set forth in Claim 1, wherein the tuning step c of the improvement further comprises the sub-steps of:

i. applying a fuzzy similarity measure to compare the membership function along each dimension of the test data with the test data;
ii. adding a new membership function along those dimensions where the fuzzy similarity measure is not satisfied;
iii. creating a new fuzzy rule including the new membership functions and those membership functions that satisfied the fuzzy similarity measure; and
iv. adding the new rule to the rule base.

4. (Original) An improved method for generating an on-line learning fuzzy inference network for the classification of data using an on-line learning fuzzy inference network as set forth in Claim 3, wherein the tuning step c of the improvement further includes the sub-steps of:

i. assigning a mean value to each new membership function equal to the value of the test data corresponding to the dimension corresponding the respective new membership function;
ii. incrementing the firing frequency count for new fuzzy rule; and
iii. assigning a classification membership to the new fuzzy rule matching the classification membership of the test data for which the rule fired.

5. (Original) A rule base generated by the method of Claim 4.

6. (Original) An improved method for generating an on-line learning fuzzy inference network for the classification of data using an on-line learning fuzzy inference network as set forth in Claim 4, wherein the membership functions are selected from the group consisting of Gaussian membership functions, triangular membership functions, and trapezoidal membership functions.

7. (Original) An improved method for generating an on-line learning fuzzy inference network for the classification of data using an on-line learning fuzzy inference network as set forth in Claim 4, wherein the membership functions are Gaussian membership functions, and the membership function parameters of each Gaussian membership function include a mean and a variance, and wherein the learning rule applied in the case of step d(ii) updates the mean and variance of the Gaussian membership functions of the fuzzy rule having the greatest firing strength according to:

$$\mu^* = (1 - \frac{|e|}{f})\mu + \frac{|e|}{f}x, \text{ and}$$

$$\sigma^* = \sqrt{(1 - \frac{|e|}{f})\sigma^2 + \frac{|e|}{f}(\sigma - x)^2}, \text{ where}$$

where μ^* represents the updated mean of the Gaussian membership function, σ^* represents the updated variance of the Gaussian membership function,

μ represents the non-updated mean of the Gaussian membership function,

σ represents the non-updated variance of the Gaussian membership function, $|e|$ represents the classification error for the Gaussian membership function,

x represents the particular value of the test data for the dimension corresponding to the Gaussian membership function, and f represents the firing frequency for the particular fuzzy rule to which the learning rule is applied.

8. (Original) An improved method for generating an on-line learning fuzzy inference network for the classification of data using an on-line learning fuzzy inference network as set forth in Claim 1, the membership functions are Gaussian membership functions, and where the membership function parameters of each Gaussian membership function include a mean and a variance, and wherein the learning rule applied in the case of step d(ii) updates the mean and variance of the Gaussian membership functions of the fuzzy rule having the greatest firing strength according to:

$$\mu^* = (1 - \frac{|e|}{f})\mu + \frac{|e|}{f}x, \text{ and}$$

$$\sigma^* = \sqrt{(1 - \frac{|e|}{f})\sigma^2 + \frac{|e|}{f}(\sigma - x)^2}, \text{ where}$$

where μ^* represents the updated mean of the Gaussian membership function, σ^* represents the updated variance of the Gaussian membership function,

μ represents the non-updated mean of the Gaussian membership function,

σ represents the non-updated variance of the Gaussian membership function, $|e|$ represents the classification error for the Gaussian membership function, x represents the particular value of the test data for the dimension corresponding to the Gaussian membership function, and f represents the firing frequency for the particular fuzzy rule to which the learning rule is applied.

9. (Original) A rule base generated by the method of claim 8.

10. (Original) An improved method for generating an on-line learning fuzzy inference network for the classification of data comprising the steps of:

    a. providing an on-line learning fuzzy inference network, wherein the fuzzy inference network generates a rule base of fuzzy rules, with each fuzzy rule assigned to a class label, and each fuzzy rule including at least one membership function corresponding to a dimension of the data, with each membership function including membership function parameters, wherein the fuzzy rules are used for classifying input data into memberships, wherein test data with a known classification membership is provided to the fuzzy inference network and wherein the fuzzy inference network uses the fuzzy rules to generate classification memberships for the test data by firing the fuzzy rules with each fuzzy rule fired assigned a firing strength based on its match to the test data, and determining the fuzzy rule having the greatest firing strength, where the membership functions of the rule having the greatest firing strength are compared to the known

classification membership of the test data to determine classification error and wherein the firing frequency count of each fuzzy rule is stored, the improvement comprising:

b. determining whether the firing strength of the fuzzy rule having the greatest firing strength exceeds a predetermined threshold;

c. in the case where the firing strength of the fuzzy rule having the greatest firing strength exceeds the threshold, tuning the fuzzy rule based on the classification error; and

d. in the case where the firing strength of the fuzzy rule having the greatest firing strength does not exceed the threshold, determining whether the classification membership generated by the fuzzy rule having the greatest firing strength correctly matches the known classification membership of the test data;

    i. in the case where the classification membership generated by the fuzzy rule having the greatest firing strength does not correctly match the known classification membership of the test data, tuning the fuzzy rule based on the classification error as provided in the case represented by c; and

    ii. in the case where the classification membership generated by the fuzzy rule having the greatest firing strength correctly matches the known classification membership of the test data, applying a learning rule to update the membership function parameters such

that the classification error is minimized for high-dimensional classification tasks.

11. (Original) An improved training system for a fuzzy inference network for on-line classification of data including a fuzzy inference network for generating a rule base of fuzzy rules, with each fuzzy rule assigned to a class label, and each fuzzy rule including at least one membership function corresponding to a dimension of the data, with each membership function including membership function parameters, wherein the fuzzy rules are used for classifying input data into memberships, wherein test data with a known classification membership is provided to the fuzzy inference network and wherein the fuzzy inference network uses the fuzzy rules to generate classification memberships for the test data by firing the fuzzy rules with each fuzzy rule fired assigned a firing strength based on its match to the test data, and determining the fuzzy rule having the greatest firing strength, where the membership functions of the rule having the greatest firing strength are compared to the known classification membership of the test data to determine classification error, the improvement comprising:

a firing frequency count calculated for each fuzzy rule and incremented each time the fuzzy rule is fired, the firing frequency count being stored in the processing device, and a rule tuning and learning rule application processor connected with the fuzzy inference network to receive the fuzzy rules; the classification error; the firing strength, the firing frequency count, and the classification membership generated by for the fuzzy rule having the greatest firing strength; the test data, and the known

classification memberships for the test data; said processor operative for determining whether the firing strength of the fuzzy rule having the greatest firing strength exceeds a predetermined threshold; and

a. in the case where the firing strength of the fuzzy rule having the greatest firing strength exceeds the threshold, tuning the fuzzy rule based on the classification error; and

b. in the case where the firing strength of the fuzzy rule having the greatest firing strength does not exceed the threshold, determining whether the classification membership generated by the fuzzy rule having the greatest firing strength correctly matches the known classification membership of the test data;

   i. in the case where the classification membership generated by the fuzzy rule having the greatest firing strength does not correctly match the known classification membership of the test data, tuning the fuzzy rule based on the classification error; and

   ii. in the case where the classification membership generated by the fuzzy rule having the greatest firing strength correctly matches the known classification membership of the test data, applying a learning rule to update the membership function parameters such that the classification error is minimized for high-dimensional classification tasks.

12. (Original) A rule base generated by the training system of claim 11.

13. (Original) An improved training system for a fuzzy inference network for on-line classification of data as set forth in Claim 11, wherein the rule tuning and learning rule application processor is further operative to:

    a. apply a fuzzy similarity measure to compare the membership function along each dimension of the test data with the test data;
    b. add a new membership function along those dimensions where the fuzzy similarity measure is not satisfied;
    c. create a new fuzzy rule including the new membership functions and those membership functions that satisfied the fuzzy similarity measure; and
    d. add the new rule to the rule base.

14. (Original) An improved training system for a fuzzy inference network for on-line classification of data as set forth in Claim 13, wherein the rule tuning and learning rule application processor is further operative to:

    a. assign a mean value to each new membership function equal to the value of the test data corresponding to the dimension corresponding the respective new membership function;
    b. increment the firing frequency count for new fuzzy rule; and
    c. assign a classification membership to the new fuzzy rule matching the classification membership of the test data for which the rule fired.

15. (Original) An improved training system for a fuzzy inference network for on-line classification of data as set forth in Claim 14, wherein the membership functions are selected from the group consisting of Gaussian membership functions, triangular membership functions, and trapezoidal membership functions.

16. (Original) An improved training system for a fuzzy inference network for on-line classification of data as set forth in Claim 14, wherein the membership functions are Gaussian membership functions, and the membership function parameters of each Gaussian membership function include a mean and a variance, and wherein the learning rule applied updates the mean and variance of the Gaussian membership functions of the fuzzy rule having the greatest firing strength according to:

$$\mu^{*} = (1 - \frac{|e|}{f})\mu + \frac{|e|}{f}x, \text{ and}$$

$$\sigma^{*} = \sqrt{(1 - \frac{|e|}{f})\sigma^{2} + \frac{|e|}{f}(\sigma - x)^{2}}, \text{ where}$$

where μ^{*} represents the updated mean of the Gaussian membership function, σ^{*} represents the updated variance of the Gaussian membership function, μ represents the non-updated mean of the Gaussian membership function, σ represents the non-updated variance of the Gaussian membership function, $|e|$ represents the classification error for the Gaussian membership function, x represents the particular value of the test data for the dimension corresponding

to the Gaussian membership function, and f represents the firing frequency for the particular fuzzy rule to which the learning rule is applied.

17. (Original) An improved training system for a fuzzy inference network for on-line classification of data as set forth in Claim 11, wherein the membership functions are Gaussian membership functions, and where the membership function parameters of each Gaussian membership function include a mean and a variance, and wherein the learning rule updates the mean and variance of the Gaussian membership functions of the fuzzy rule having the greatest firing strength according to:

$$\mu^{*} = (1 - \frac{|e|}{f})\mu + \frac{|e|}{f}x \text{, and}$$

$$\sigma^{*} = \sqrt{(1 - \frac{|e|}{f})\sigma^{2} + \frac{|e|}{f}(\sigma - x)^{2}} \text{, where}$$

where μ^{*} represents the updated mean of the Gaussian membership function, σ^{*} represents the updated variance of the Gaussian membership function, μ represents the non-updated mean of the Gaussian membership function, σ represents the non-updated variance of the Gaussian membership function, $|e|$ represents the classification error for the Gaussian membership function, x represents the particular value of the test data for the dimension corresponding to the Gaussian membership function, and f represents the firing frequency for the particular fuzzy rule to which the learning rule is applied.

18. (Original) A rule base generated by the training system of claim 17.

19. (Original) An improved training system for a fuzzy inference network for on-line classification of data comprising:

   a. an on-line learning fuzzy inference network wherein the fuzzy inference network generates a rule base of fuzzy rules, with each fuzzy rule assigned to a class label, and each fuzzy rule including at least one membership function corresponding to a dimension of the data, with each membership function including membership function parameters, wherein the fuzzy rules are used for classifying input data into memberships, wherein test data with a known classification membership is provided to the fuzzy inference network and wherein the fuzzy inference network uses the fuzzy rules to generate classification memberships for the test data by firing the fuzzy rules with each fuzzy rule fired assigned a firing strength based on its match to the test data, and determining the fuzzy rule having the greatest firing strength, where the membership functions of the rule having the greatest firing strength are compared to the known classification membership of the test data to determine classification error and wherein the firing frequency count of each fuzzy rule is stored;

   b. a rule tuning and learning rule application processor connected with the fuzzy inference network to receive the fuzzy rules; the classification error; the firing strength, the firing frequency count, and the classification

membership generated by the fuzzy rule having the greatest firing strength; the test data, and the known classification memberships for the test data; said processor operative for determining whether the firing strength of the fuzzy rule having the greatest firing strength exceeds a predetermined threshold; and

i. in the case where the firing strength of the fuzzy rule having the greatest firing strength exceeds the threshold, tuning the fuzzy rule based on the classification error; and

ii. in the case where the firing strength of the fuzzy rule having the greatest firing strength does not exceed the threshold, determining whether the classification membership generated by the fuzzy rule having the greatest firing strength correctly matches the known classification membership of the test data;

    a. in the case where the classification membership generated by the fuzzy rule having the greatest firing strength does not correctly match the known classification membership of the test data, tuning the fuzzy rule based on the classification error; and

    b. in the case where the classification membership generated by the fuzzy rule having the greatest firing strength correctly matches the known classification membership of the test data, applying a learning rule to update the membership function

parameters such that the classification error is minimized for high-dimensional classification tasks.

Merriam-Webster Online Dictionary

One entry found for **online**.

Main Entry: **on·line**
Pronunciation: 'on-'lIn, 'än-'lIn
Function: *adjective*
: connected to, served by, or available through a system and especially a computer or telecommunications system (as the Internet) <an *online* database>; *also* : done while connected to such a system <*online* shopping>
- **online** *adverb*

For **More Information on "online" go to Britannica.com**
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Pronunciation Symbols

online